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Title: A transactional "second victim"-model – experiences of affected healthcare professionals in acute-somatic inpatient settings: a qualitative metasynthesis

Short title: A transactional "second victim"-model

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Contributors

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Presentations

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Transparency declaration

The lead author (manuscript's guarantor) affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

ABSTRACT

Background: "Second victims" are healthcare professionals traumatized by involvement in significant adverse events. Associated burdens, e.g., guilt, can impair professional performance, thereby endangering patient safety. To date, however, a model of second victims' experiences towards a deeper understanding of qualitative studies is missing. Therefore, we aimed to identify, describe and interpret these experiences in acute-somatic inpatient settings.

Methods: This qualitative metasynthesis reflects a systematic literature search of PubMed, CINAHL and PsycINFO, extended by hand searches and expert consultations. Two researchers independently evaluated qualitative studies in German and English, assessing study quality via internationally approved criteria. Results were aggregated quantitatively and analysed inductively.

Results: Based on 19 qualitative studies (explorative-descriptive: n=13; grounded theory: n=3; phenomenology: n=3), a model of second victim experience was drafted. This depicts a multi-stage developmental process: in appraising their situation, second victims focus on their involvement in an adverse event and become traumatized. To restore their integrity, they attempt to understand the event and to act accordingly; however, their reactions are commonly emotional and issue-focused. Outcomes include leaving the profession, surviving or thriving. This development process is alternately modulated by safety culture and healthcare professionals.

Conclusions: For the first time, this model works systematically from the second-victim perspective based on qualitative studies. Based on our findings, we recommend integrating second victims' experiences into safety culture and root-cause analyses. Our transactional model of second victim experience provides a foundation for strategies to maintain and improve patient safety.

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INTRODUCTION

The term "second victim", introduced by Wu (2000), describing healthcare professionals traumatized via involvement in serious adverse events.[1,2] Having unintentionally caused harm to patients ("first victims"), many consider these events as personal failures, losing their confidence as clinicians and professionals.[1,2] However, in today's complex healthcare environments, eventual involvement in a serious adverse event is normal.[3] When adverse events–defined by their potential for harm[4]–affect patients, guilt, frustration, and fear can impair involved healthcare professionals' performance, further endangering patient safety.[3]

Hilfiker (1984) and Leape (1994) highlighted human fallibility in medical settings;[5,6] and in 2000, the US Institute of Medicine published *"To err is human*".[7] That report estimated that up to 98 000 persons died annually in the US from medical errors, leading to associated expenses as high as 29 billion USD.[7] Current estimates place the annual death relating to adverse events up to 440 000.[8] However, even these figures are questionable: many cases go unreported, as therapy- and disease-related harm are often indistinguishable.[9] Internationally, while patient safety is a global priority, the incidence rate of adverse events is 14.2 per 100 hospitalisations per year in high-income countries.[10,11]

From 2009–2017, review articles focused on qualitative and quantitative second-victim studies of varying explanatory power in the US, Asia and Europe.[3,12–16] These indicated that second victims experience intense emotional burdens (e.g., burnout and depression), impacting their personal relationships, their professional collaborations, their physical health, and even their institutions ("third victims").[3,12–14,16]

However, while supportive environmental conditions (e.g., support from colleagues) are beneficial, many institutional reactions simply compound the damage.[3,13] Ideally, care teams and superiors support their affected colleagues, while their organizations ensure that supportive structures are embedded in their safety culture.[3,12–16] Research has yet to identify how to relieve second victims' burdens while considering short- and long-term affects to safety culture.[3,12,15]

Within healthcare organizational culture, safety culture reflects management and staff values, attitudes, perceptions, competencies and behaviours regarding individual fallibility.[17] Therefore security-promoting behaviour depends not only on individual character, but on collectively shared values.[18]

Although increasing numbers of differentiated, empirical studies illuminate second victims' experiences, no review article have systematically aggregated nor interpreted regarding theory formation and development. Moreover, shortages of theoretical associations often preclude in-depth understanding of interactions. Even though, e.g., Lazarus' stress model or Antonovsky's concept of salutogenesis help elucidate second victim experience e.g. by

means of cognitive appraisals relating to stress or a jeopardized Sense of Coherence,[19,20] yet no available model explains the overall second-victim construct.

Until now, strategies to maintain or improve patient safety have focused on affected patients. By shifting "from a personal to a systemic perspective" incident analyses and safety culture promotion become strategic pillars of patient safety[21]. Regarding healthcare priorities and lack of support for many second victims,[10,12–14,16] a model of their experience will, by increasing the visibility of the often neglected experiences of second victims, contribute to a higher level of awareness regarding this vulnerable group.

This qualitative metasynthesis is rooted in holistic thinking akin to pragmatism and aims to describe and interpret second victims' experiences in acute-somatic settings from this group's perspective. We approach experience as a learning process evolving and generating meanings between the individual and the context.[22–24]

METHODS

This qualitative metasynthesis follows Sandelowski and Barroso's (2007) steps: goalsetting, literature search, evaluation of studies, classification of results, metasynthesis and metasummary.[25] The ENTREQ statement was used to ensure methodical rigour.[26]

Goalsetting and literature search

The SPIDER structure was used for goalsetting and keywords (table 1), referring to the SPIDER structure and associated with Boolean operators, were used to search in PubMed, CINAHL und PsycINFO without temporal limitations (27.09.2016, update: 23.12.2016).[27]

[**Table 1:** Search string in PubMed, CINAHL and PsycINFO]

Additionally, we searched reference lists of included studies, other systematic reviews, study protocols, professional publications, dissertations, and monographs, and contacted authors (n=22).

We included original German- and English-language articles offering insight into second-victim experience based on qualitative designs, and conducted interviews, predominantly of healthcare professionals in acute-care inpatient settings. We excluded studies in other languages, non-original articles, mixed-methods studies, non-research-based articles and first-level interpretations (e.g. interview transcripts).

Evaluation of studies

For the initial screening, the first and fifth author independently checked all titles and abstracts according to predefined inclusion criteria. Next, they read potentially relevant full texts. For both steps, inter-rater reliability was determined.[28,29] We discussed discrepancies until we reached consensus.

For individual evaluation, following Sandelowski and Barroso's guidance, the authors read all included studies repeatedly with increasing attention to detail, and wrote synopses of all.[25] For overarching conclusions, they tabulated and compared study evaluations.[25]

Classification of results

The first author dichotomized the result sections of all included studies as first- or second-level interpretations, and evaluated each one's methodology regarding design, sample, data collection and analysis.[30] The fifth author verified 47% of these evaluations.

Metasynthesis

We performed an inductive qualitative data analysis using MAXQDA V.12.[31] "First cycle coding" involved line-by-line micro-analysis of second-level interpretations of the included studies' results sections.[31] Via splitting, we grouped qualitative data into open, inductive single-word- or phrase-based codes.[31] "Second cycle coding" differentiated categories by means of subcodes and codes.[31] This resulted in a conceptual model.[31]

Metasummary

To avoid under- or overrating individual findings we quantitatively aggregated qualitative data.[25] After extracting, paraphrasing, categorizing and abstracting as parts of the metasynthesis described above, we calculated via the following formulas by means of code frequencies, which results were the most frequent across the studies (frequency) and how much each study contributed to the analysis (intensity):

$$frequency = \frac{\text{number of publications of a certain category (n = 16)}}{\text{total number of publications (n = 19)}}$$

$$intensity = \frac{\text{number of categories per publication (n = 4)}}{\text{total number of categories (n = 5)}}$$

Trustworthiness

To ensure our results' trustworthiness, we applied Sandelowski and Barroso's descriptive, interpretative, theoretical, and pragmatic validity criteria.[25] The first author's in-depth familiarity with the second victim issue contributed to his nuanced understanding of this subject. In addition, regular meetings within the research team contributed to this study's interpretative and theoretical validity. Furthermore, the comprehensive and systematic literature search, the metasummary and the inclusion of studies with heterogeneous epistemiological bases strengthened the interpretative and theoretical validity. The research steps described above further strengthened our results' descriptive and pragmatic validity.[25]

RESULTS

Included studies

Evaluations of the chosen studies' titles and abstracts (figure 1) resulted in high inter-rater reliability (k=0.78); full-text evaluations yielded near-perfect inter-rater reliability (k=0.96), leading to inclusion of 19 studies.[2,32–49] For reasons of methodological quality, no studies were excluded (figure 2).[25]

[**Figure 1:** Flow diagram of included studies]

[**Figure 2:** Methodological quality of included studies]

The 19 between 1992 and 2016 published studies (explorative-descriptive studies[2,32,33,35,36,39,43–49], grounded theories[34,37,42], phenomenologies[38,40,41]) involved 478 predominantly medical or nursing healthcare professionals of both genders ($n_{physicians}$=325 and n_{nurses}=131) in American ($n_{studies}$=9), European ($n_{studies}$=8) and Asian ($n_{studies}$=2) hospitals. Despite diverse descriptions and definitions of adverse events, all focused on the healthcare professionals' response to actual or potential patient harm. (table 2)

[**Table 2:** Study characteristics]

Metasynthesis: Transactional "second victim" experience

Our metasynthesis outlined a transactional "second victim" experience model (figure 3). Vertically, this represents a system open to external influences, with mutual modulation between *safety culture* and *healthcare professionals*. Due to reciprocity, indicated by arrows, *safety culture* is both a central influencing factor regarding affected *healthcare professionals* and an endpoint.

Horizontally, iterative development begins with *appraising the situation,* extending first to *restoring integrity,* then *continuing professional life*. Between *appraising the situation* and *restoring integrity*, *healthcare professionals weigh their internal and external resources*. For example, they activate personal resources and receive assistance from colleagues via *safety culture*.[49] However, while second victims often need support urgently[2,32,38,43–49] and search for "emotional relief valves",[35,49] they tend to deny themselves such support via undemanding or unreceptive behaviour.[32,34,39,41,46,48,49]

"Several claimed that they did not have any expectations about getting support because they had made a mistake, and therefore had to bear the consequences themselves."[46, p.321]

[**Figure 3:** Transactional "second victim" experience]

Safety culture and *healthcare professionals*

S*afety culture* influences whether and to what extent *healthcare professionals* become second victims.[2,36,41,43,47–49] Acknowledgment of second victims' need for help is a first step toward overcoming the negative consequences of the „blame-shame culture" that dominates many institutions.[2,32,34,36,38,40,41,43,44,46,47,49]

Communicative processes are formative in a *safety culture*. For example, speaking to first victims can be therapeutic for second victims; however, emotional issues for both first and second victims can make discussions challenging.[32,33,35,37–42,46] Considering second victims' damaged professional confidence, they often share their feelings with friends rather than medical professionals.[2,32,33,35–37,40–42,44,46–49] While this informal support channel usually involves persons with no professional healthcare background,[33,35,46–49] the advantage of disclosing one's inner feelings and preserving a perspective "from the outside" can outweigh the disadvantages.[2,33,35] While professional assistance offers both trustability and a neutral perspective, it can also be associated with stigmatization. [49,38] And while empathic and

sympathetic team behaviour can benefit second victims, staying silent or minimizing an event can be regressive.[34,39,40,48] Likewise, within a robust safety culture, superiors can use adverse events to imprint that culture via role modeling,[38,46,47] e.g., cultivating a trustful, systemic perspective on errors and addressing informational needs e.g. concerning support programs.[2,37,39,44,45,47–49]

> *"The respondents within this study suggested that none of these support systems are possible if there is not an organizational patient safety culture."*[49, p. 9]

Depending on the event's seriousness, second victims are often eager both to learn and to contribute to safety culture via root-cause analyses (RCA).[35,37,39,41,42,47,48] As *understanding* and *acting* require readiness to learn, training and further education are vital not only to preventing adverse events, but to responding to their occurance.[33,39,44,47–49]

Healthcare professionals respond similarly to different events, based on their seriousness.[2,33,35,36,40,41,48,49] In the conflict between expectation and reality, personally experienced responsibility is of major importance for many second victims.[32,34–37,41,43,45,48] Reactions can also depend upon personal traits, e.g., self-efficacy, resilience, perfectionism or professional experience, spirituality, and gender aspects.[2,33,37,38,40–42,47–49] E.g., as a result of a perfectionism, healthcare professionals may be more affected by feelings of guilt when they interpret errors as individual failures and seek zero tolerance for errors.

Appraising the situation: Experiencing stress and trauma

After initial incomprehension, second victims *realise* their responsibility for avoidable *events*.[2,34,40,44,46,48] In our model, only events associated with significant *stress* have further relevance. Non-stressful events can inspire either a sense of *well-being* (good luck) or *learning*.[35,36,41,47]

After initial nonspecific stress experience (e.g., shock), second victims *respond* rather *physiologically* or rather *psychosocially*.[32–34,40,46–49] *Physically*, common symptoms range from *sleep disturbance* to muscular tension.[2,33,34,38,41,43,44,46–49] *Psychosocial* responses are characterized by a sense of damaged personal integrity:[32,33,35,37,38,40,43,45–47,49]

> *"Nurses expressed feelings of guilt because they felt that they had oppressed or betrayed someone who had needed them and had trusted them with his or her life."*[40, p. 5]

Having participated in a serious adverse event, second victims suffer severely conflicting emotions: having caused suffering, some feel they should suffer;[32–41,43,45–49] having suffered trauma, many experience *anxiety and panic, with potential health consequences*.[2,33–35,37,40,43–46,48,50] A broad variety of a*nxieties* of second victims are related both to the harm of first victims and to their own situation as second victims, e.g. anxiety to loss of trust and legal consequences.[2,33,34,40,41,43–46,48,49] Additionally, feelings of inadequacy, uncertainty, and reduced *self-confidence* often arise.[2,32–35,37,38,40,44–49] Other consequences can include flashbacks, burnout syndrome, *depression* and suicidal thoughts.[2,33,37,40,41,44–46,48,49] On a

personal level, *psychosocial responses* swing between anger-frustration and regret-repentance; on a *professional* level, reduced *performance* can manifest as efficiency deficits or defensive decision-making.[2,32–38,40,41,44,46,48,49]

Unlike normal stressful events, second victim experiences include incisive *trauma*, with effects extending beyond initial stress responses and leaving a profound impression at both private and professional levels.[2,32–35,37,40,41,43–49]

Restoring integrity: Understanding and acting

Second victims need an internally and externally motivated (e.g., by superiors) *restoration of integrity*.[2,32,33,37,42,46,49] The *emotion- and event-oriented process of acting* on traumatic experience can be rather *constructive* or rather *destructive.* Focusing on *understanding and acting,* its aim is to achieve a return to work as soon as possible, with regained self-esteem.[2,34–37,39,41,42,46,48,49] A discursive process combining reconciliation/forgiveness with coping with imperfection has proved key to *returning to professional life.*[33,34,36,37,42,46]

Repressive mechanisms, e.g., *rationalisation*, *self-punishment, minimalisation,* are *destructive emotion-oriented responses to adverse events;* more *constructive emotion-oriented strategies, e.g., disclosing* the event to the first victim often receive high priority, but can have complex outcomes:[32–37,39–43,45–49]

> *"Although they were comforted when the family forgave them or grieved alongside them, surgeons also recognised difficulty with these interactions."*[37, p. 1184]

Many second victims wish to apologize to their corresponding first victims but received lawyers' recommendations to maintain silence.[34,39,42,43] For some, *disclosing* the event results from a process of consideration.[33,34,36–38,40,42,45,46,48] Depending on the level of harm and "real" error, second victims may disclose varying degrees of detail.[33,34,36,37,40,42,45,46,48] In this respect, along with events that cause harm with potential legal consequences, for well-known events are favourable for *disclosure*; unknown error events, as well as anxiety and minor length of service on the part of the second victim, are unfavourable.[34,36]

While *minimalisation* is a rather *destructive task-oriented way of dealing with an event*, *constructive task-oriented strategies,* e.g., learning, rank among the most helpful.[2,32–38,40–44,46,48,49] In the short term, second victims strive to reduce *harm* in first victims and to restore medical stability;[33,35,40,43] in the medium term, they wish to participate in root-cause analyses to prevent recurrences of their experiences and *to optimize the system*, e.g., via error prevention programs;[2,33–35,37–39,41,42,44,47–49] and in the long term, it is necessary to *extension perspectives* towards fallibility.[34,40,42] Expressions of this include improvement-oriented behaviour patterns, *increased mindfulness* with regard to imperfectness, and self-care, as well as increased patient-centricity.[2,33,37,41–44,46,49]

Continuing professional work: Finding meaning

Traumatic second victim experience also has a long-term existential effect on *professional life*.[46] *Re-evaluation* and *perceived meaning* can both support private and professional improvement of the situation.[42]

While second victims with serious professional doubts may *change their positions* or *leave their profession*, some second victims continue their profession lives with unimpaired performance despite a *trajectory of burden* and *reduced work satisfaction (surviving)*.[2,32,36,37,44,46,48,49]

Most desirably, *thriving* can follow a positive turn of a traumatic experience, characterized by *enhanced expertise* and an *evolved personality*.[2,33,37,42,44,45] Both can manifest in improved handling of complexity and uncertainty, as well as in a revised view of oneself and the world. *Second victims* who have regained their self-confidence see themselves as imperfect, but good *healthcare professionals*:[33,37,42,44,45]

> *"[in]<the humble expert>… physicians described learning to temper their expertise with humility and learning to have confidence without being cocky."* [42, p. 240]

Metasummary

As table 3 shows, all included studies contributed to one or more of three categories: *safety culture*, *appraising the situation,* and *restoring integrity;* 58% contributed to all categories.[2,32–34,36,37,41,42,45,48,49] The median contribution of each study was 5%; the most recent and the oldest were most influential.[33,49]

[**Table 3:** Metasummary]

DISCUSSION

This qualitative metasynthesis highlighted, described and interpreted second victim experiences in acute-somatic settings. Based on nineteen qualitative studies, the main outcome is a model of transactional second victim experience. Including the central stages of appraising the situation, restoring integrity and continuing professional life, this experience is moderated by safety culture and healthcare professionals. The model finds its theoretical foundation in Lazarus' model of stress, as well as in Antonovsky's "sense of coherence".[19,20] Against the background of a primarily physiological experience,[3] we assumed that supporting a person to restore their integrity could prevent long-term pathological consequences. There is some evidence, that support from peers and superiors can have a protective influence on burnout.[51] A prospective longitudinal study showed that, in the context of serious adverse events, assistant physicians have significantly increased burnout scores and a threefold elevated risk of depression.[52]

Scott (2015) reaffirmed that safety culture can be both a key factor of support, and a measurable endpoint.[53] Additionally to the wish of second victims for cultural change and learning needs, the authors emphasized the importance of communication with first victims, support by peers and superiors, and external emotional support as factors of a positive

safety culture. These factors are congruent with safety culture features described elsewhere.[54]

An organization's treatment of second victims reflects its safety culture and represents an important aspect of socialization. Ideally, adverse events offer team learning opportunities. Regarding organizational support and underscoring the importance of results from Burlison et al. (2016), alongside absenteeism, their results associate intention to abandon one's workplace significantly with the support of peers and superiors.[55] In fact, peer support is the strongest predictor of second victims' recovery;[55] and Edrees et al. (2016) observed that recovery can be improved and promoted via institutionalised telephone support from colleagues.[56] However, the current results support the literature's indications that collegial readiness to support second victims can be limited:[57] barriers to support programs' use include missing knowledge about their availability and doubts regarding their reliability.[56,58,59]

After the initial stress response, the second victim's appraisal of the situation is influenced by feelings of guilt and reduced professional performance. In systematic reviews, guilt was the those most frequently reported emotional response.[12,14,16] The current results concerning second victims' efficiency deficits and tendencies towards defensive decision-making confirm the thesis regarding reciprocity of error involvement, post-traumatic stress response, and endangered patient safety due to reduced professional performance.[3]

Disclosing the event relates significantly to reducing guilt feelings and can contribute to restoring ones sense of integrity; however, disclosure only occurred in a third of cases.[60] The present metasynthesis described disclosure as a process of consideration, which is also expressed in a just recently published "qualitative systematic review" ($n_{Studies}$=9) using the Joanna Briggs Institute meta-aggregation approach about second victim experiences of predominantly female nurses, which describes disclosing as a dilemma.[61] Reasons for forgoing disclosure include fear of legal consequences, deficient communication skills, and inadequate support.[60] Interprofessional skill training could overcome missing communication skills; this would benefit the second victim by increasing the chances of the first victim directly forgiving them.[60,62,63] According to the outlined potential of disclosing adverse events on the recovery of second victims, it is necessary to establish guidelines and structures that promote, instead of often selective, full disclosure; this not only as a strategy to reduce liability damages, but also to meet ethical obligations to first and second victims.[64–67]

This metasummary on the one hand offers comprehensive state of knowledge regarding safety culture, situational appraisal and restoring integrity. On the other hand, it illuminates knowledge gaps concerning destructive forms of dealing with the event. This knowledge gap may result from an underlying selection bias of included studies. It is possible that only second victims with predominantly constructive strategies for dealing with adverse events are recruited for studies, as others are unavailable due to changing their profession. However,

especially during a deepening skills shortage, further knowledge should be obtained by identifying the perspectives of colleagues who support second victims.[68] Not disclosing an event proved to be the most frequent defensive coping strategy in the review by Seys et al. (2013).[14]

Limitations

To the authors' knowledge, the current model offers the first conceptual framework to understand second victim experience across professions and cultures. Despite efforts to ensure reliability, the results should be seen in the context of two major limitations. For the most part, only one person evaluated the methodological quality of included studies and coded the data of only German- and English-language articles in German. Additionally, being three-times removed from direct experience may have diminished the results' credibility during interpretation.

CONCLUSIONS

The newly developed model works for the first time systematically from the second victim perspective based on qualitative studies including majoritarian physicians and nurses. This perspective should increasingly be applied to daily practice to promote institutional safety culture. As a platform upon which to refine policies fostering professional development and preservation, the new model contributes ultimately to patient safety.

Implications for practice

Many organizations are unprepared for serious adverse events.[69] The need for hospitals to conceive second victim experience as a clinical emergency and to prepare accordingly is emphasized.[70]

Our results indicate that hospital safety culture affects not only patients, but healthcare professionals. Therefore, safety culture can provide a path to support second victims in restoring their integrity. These results indicate a scope for integrating second victims in RCA, in the elaboration and implementation of recommendations for event disclosure to first victims, in ensuring a trustful approach to superiors, in learning from a systemic viewpoint and in communicating existing support programs. While the effectiveness of RCA in learning from errors and preventing recurrences can be questioned, RCA has the potential to relief burdens of affected healthcare professionals at the sharp end due to insights in the systematic emergence of adverse events.[71,72]

Implications for education

Stakeholders in education should meet second victims' request for a culture prepared for adverse events. One central prerequisite would be curricular integration of the second victim experience on all levels of healthcare professional education. In this regard definitions and descriptions of factors triggering second victim phenomena, consequences, theoretical frameworks, support systems, and barriers to support are all relevant.[73] The second victim

transactional model can support curriculum development, transmit a valid knowledge base and contribute to socialization in dealing with human fallibility.

Implications for research

According to the current knowledge concerning safety culture, appraisal of adverse event situations and restoration of integrity, further research should focus on developing and implementing effective supportive interventions. Therefore, the model of transactional second victim experience provides a valid knowledge base and promotes the integration of the affected persons' perspectives. Investigating the effectiveness of supportive interventions and examining the problem vis-à-vis payers will require development and evaluation of culture-specific instruments to assess second victim experience including support. For practical use, an instrument such as the Burlison's et al. (2017) could facilitate discussions and supportive approaches.[74] To ensure targeted support in the early, it should differentiate between second victim experience and burnout or depression. The newly developed transactional model of second victim experience will contribute to this.

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REFERENCES

1. Wu AW. Medical error: The second victim: the doctor who makes the mistake needs help too. *BMJ* 2000;320:726–7.
2. Scott SD, Hirschinger LE, Cox KR, et al. The natural history of recovery for the healthcare provider "second victim" after adverse patient events. *Qual Saf Health Care* 2009;18:325–30.
3. Schwappach DL, Boluarte TA. The emotional impact of medical error involvement on physicians: a call for leadership and organisational accountability. *Swiss Med Wkly* 2009;139:9–15.
4. World Health Organization. Conceptual Framework for the International Classiciation for Patient Safety Version 1.1: Final Technical Report. Geneva: World Health Organization, 2009.
5. Hilfiker D. Facing our mistakes. *N Engl J Med* 1984;310:118–22.
6. Leape LL. Error in medicine. *JAMA* 1994;272:1851–7.
7. Kohn LT, Corrigan JM, Donaldson MS. To Err is Human: Building a Safer Health System. Washington: National Academy Press, 2000.
8. James JT. A new, evidence-based estimate of patient harms associated with hospital care. *J Patient Saf* 2013;9:122–8.
9. Vincent C. Das ABC der Patientensicherheit [Schriftenreihe Nr. 4]. Zürich: Patientensicherheit Schweiz, 2012.
10. World Health Organization. Global Priorities for Patient Safety Research: Better Knowledge for Safer Care. Geneva: World Health Organization, 2009.
11. Jha AK, Larizgoitia I, Audera-Lopez C, et al. The global burden of unsafe medical care: analytic modelling of observational studies. *BMJ Qual Saf* 2013;22:809–15.
12. Sirriyeh R, Lawton R, Gardner P, et al. Coping with medical error: a systematic review of papers to assess the effects of involvement in medical errors on healthcare professionals' psychological well-being. *BMJ Qual Saf* 2010;19:e43.
13. Lewis EJ, Baernholdt M, Hamric AB. Nurses' experience of medical errors. *J Nurs Care Qual* 2013;28:153–61.
14. Seys D, Wu AW, van Gerven E, et al. Health care professionals as second victims after adverse events: a systematic review. *Eval Health Prof* 2013;36:135–62.
15. Seys D, Scott S, Wu A, et al. Supporting involved health care professionals (second victims) following an adverse health event: a literature review. *Int J Nurs Stud* 2013;50:678–87.
16. Chan ST, Khong PCB, Wang W. Psychological responses, coping and supporting needs of healthcare professionals as second cictims. *Int Nurs Rev* 2016;64:242–62.

17. Health and Safety Commission Advisory Committee on the Safety of Nuclear Installations. Third Report of the ACSNI Study Group on Human Factors: Organizing for Safety. Sudbury: HSE Books, 1993.
18. Pfaff H, Hammer A, Ernstmann N, et al. Safety culture: definitions, models and design. *Z Evid Fortb Qual Gesundheitswes* 2009;103:493–7.
19. Lazarus RS. Stress, Bewältigung und Emotionen: Entwicklung eines Modells. In: Rice VH, Hrsg. Stress und Coping: Lehrbuch für Pflegepraxis und -wissenschaft. Bern: Huber; 2005:231–363.
20. Antonovsqi A, Franke A, Hrsg. Salutogenese: Zur Entmystifizierung der Gesundheit. Tübingen: DGVT-Verlag, 1997.
21. Reason J. Human error: Models and management. *BMJ* 2000;320:768–70.
22. Watson SJ. An analysis of the concept of experience. *J Adv Nurs* 1991;16:1117–21.
23. Ballnat S. Das Verhältnis zwischen den Begriffen "Erfahrung" und "Sprache" ausgehend von Hans-Georg Gadamers "Wahrheit und Methode": Eine antireduktionistische Lesart gegen Relativismusvorwürfe [Dissertation]. Potsdam: Universität Potsdam, 2012.
24. Ricken F. Glauben weil es vernünftig ist. Stuttgart: Kohlhammer, 2007.
25. Sandelowski M, Barroso J. Handbook for Synthesizing Qualitative Research. New York: Springer; 2007.
26. Tong A, Flemming K, McInnes E, Oliver S, Craig J. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Med Res*. 2012;12:181.
27. Cooke A, Smith D, Booth A. Beyond PICO: the SPIDER tool for qualitative evidence synthesis. *Qual Health Res*. 2012;22:1435–43.
28. Cohen J. A coefficient of agreement for nominal scales. *Educ Psychol Meas* 1960;20:37–46.
29. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;33:159–74.
30. Panfil E, Ivanovic N. Methodenpapier FIT-Nursing Care: Version 1.0. June, 2011. Available at: https://www.fitcare.ch/documents/8165518/0/110615_Methodenpapier_FIT%2BNC_Juni.pdf/a6d68f1c-55c9-4d09-982f-b40a374c0b2c. Accessed November 16, 2017.
31. Saldaña J. The Coding Manual for Qualitative Researchers. Los Angeles: Sage, 2015.
32. Balogun JA, Bramall AN, Bernstein M. How surgical trainees handle catastrophic errors: a qualitative study. *J Surg Educ* 2015;72:1179–84.
33. Christensen JF, Levinson W, Dunn PM. The heart of darkness: the impact of perceived mistakes on physicians. *J Gen Intern Med* 1992;7:424–31.

34. Crigger NJ, Meek VL. Toward a theory of self-reconciliation following mistakes in nursing practice. *J Nurs Scholarsh* 2007;39:177–83.
35. Engel KG, Rosenthal M, Sutcliffe KM. Residents' responses to medical error: coping, learning and change. *Acad Med* 2006;81:86–93.
36. Kroll L, Singleton A, Collier J, et al. Learning not to take it seriously: junior doctors' accounts of error. *Med Educ* 2008;42:982–90.
37. Luu S, Patel P, St-Martin L, et al. Waking up the next morning: surgeons' emotional reactions to adverse events. *Med Educ* 2012;46:1179–88.
38. Mankaka C, Waeber G, Gachoud D. Female residents experiencing medical errors in general internal medicine: a qualitative study. *BMJ Med Educ* 2014;14:140.
39. May N, Plews-Ogan M. The role of talking (and keeping silent) in physician coping with medical error: a qualitative study. *Patient Educ Couns* 2012;88:449–54.
40. Mohsenpour M, Hosseini MA, Abbaszadeh A, et al. Iranian nurses' experience of "being a wrongdoer": a phenomenological study. *Nurs Ethics* 2016; doi:10.1177/0969733016660880
41. Pinto A, Faiz O, Bicknell C, et al. Surgical complications and their implications for surgeons' well-being. *Br J Surg* 2013;100:1748–55.
42. Plews-Ogan M, Owens JE, May NB. Wisdom through adversity: learning and growing in the wake of an error. *Patient Educ Couns* 2013;91:236–22.
43. Rassin M, Kanti T, Silner D. Chronology of medication errors by nurses: accumulation of stresses and PTSD symptoms. *Issues Ment Health Nurs* 2005;26(8):873–86.
44. Rinaldi C, Leigheb F, Vanhaecht K, et al. Becoming a "second victim" in health care: pathway of recovery after adverse event. *Rev Calid Asist* 2016;31:11–19.
45. Santos JO, Silva AEBdC, Munari DB, et al. Feelings of nursing professionals after the occurrence of medication errors. *Acta Paul Enferm* 2007;20:483–8.
46. Schelbred A, Nord R. Nurses' experiences of drug administration errors. *J Adv Nurs* 2007;60:317–24.
47. Schwappach D, Hochreutener M, von Laue N, et al. Konkretisierung im nationalen Kontext. In: Schwappach D, Hochreutener M, von Laue N, et al., Hrsg. Täter als Opfer: Konstruktiver Umgang mit Fehlern in Gesundheitsorganisationen [Schriftenreihe Nr. 3, Empfehlungen für Kader, Kollegen und Betroffene]. Zürich: Patientensicherheit Schweiz, 2010.
48. Ullström S, Sachs MA, Hansson J, et al. Suffering in silence: a qualitative study of second victims of adverse events. *BMJ Qual Saf* 2014;23:325–31.
49. van Gerven E, Deweer D, Scott SD, et al. Personal, situational and organizational aspects that influence the impact of patient safety incidents: a qualitative study. *Rev Calid Assist* 2016;31:34–46.

50. van Gerven E, Bruyneel L, Panella M, et al. Psychological impact and recovery after involvement in a patient safety incident: a repeated measures analysis. *BMJ open* 2016;6:e011403.
51. Lewis EJ, Baernholdt MB, Yan G, Guterbock TG. Relationship of adverse events and support to RN Burnout. *J Nurs Care Qual* 2015;30:144–52.
52. West CP, Huschka MM, Novotny PJ, et al. Association of perceived medical errors with resident distress and empathy: a prospective longitudinal study. *JAMA* 2006;296:1071–78.
53. Scott SD. Second victim support: implications for patient safety attitudes and perceptions. *PSQH* 2015:26–31.
54. Sammer CE, Lykens K, Singh KP, et al. What is patient safety culture? A review of the literature. *J Nurs Scholarsh* 2010;42:156–65.
55. Burlison JD, Quillivan RR, Scott SD, et al. The effects of the second victim phenomenon on work-related outcomes: connecting self-reported caregiver distress to turnover intentions and absenteeism. *J Patient Saf* 2016.
56. Edrees H, Connors C, Paine L, et al. Implementing the RISE second victim support programme at the johns hopkins hospital: a case study. *BMJ Open* 2016;6.
57. Newman MC. The emotional impact of mistakes on family physicians. *Ann Fam Med* 1996;5:71–5.
58. Joesten L, Cipparrone N, Okuno-Jones S, et al. Assessing the perceived level of institutional support for the second victim after a patient safety event. *J Patient Saf* 2015;11:73–8.
59. Harrison R, Lawton R, Perlo J, et al. Emotion and coping in the aftermath of medical error: a cross-country exploration. *J Patient Saf* 2015;11:28–35.
60. Wu AW, Boyle DJ, Wallace G, et al. Disclosure of adverse events in the United States and Canada: an update and a proposed framework for improvement. *J Public Health Res* 2013;2:186.
61. Cabilan CJ, Kynoch K. Experiences of and support for nurses as second victims of adverse nursing errors: a qualitative systematic review. *JBI Database Systema Rev Implement Rep*. 2017;15(9):2333–2364.
62. Kalra J, Kalra N, Baniak N. Medical error, disclosure and patient safety: a global view of quality care. *Clin Biochem* 2013;46:1161–9.
63. Ragucci KR, Kern DH, Shrader SP. Evaluation of interprofessional team disclosure of a medical error to a simulated patient. *Am J Pharm Educ* 2016;80:138.
64. Monteverde S, Schiess C. Der Umgang mit "second victims" als oragnisationsethische Aufgabe. *Ethik Med* 2017;30:205.

65. Kraman SS, Hamm G. Risk management: extreme honesty may be the best policy. *Ann Intern Med*. 1999;131:963–7.
66. Carrillo I, Mira JJ, Guilabert M, Lorenzo S. Why an open disclosure procedure is and is not followed after an avoidable adverse event. *J Patient Saf*. 2017;00(00):0.
67. Bell SK, Smulowitz PB, Woodward AC, et al. Disclosure, apology, and offer programs: stakeholders' views of barriers to and strategies for broad implementation. *Milbank Q*. 2012;90:682–705.
68. Ferrus L, Silvestre C, Olivera G, et al. Qualitative study about the experiences of colleagues of health professionals involved in an adverse event. *J Patient Saf* 2016.
69. Mira JJ, Lorenzo S, Carrillo I, et al. Interventions in health organisations to reduce the impact of adverse events in second and third victims. *BMC Health Serv Res* 2015;15:341.
70. Schwappach D, Hochreutener M, von Laue N, et al., Hrsg. *Täter als Opfer: Konstruktiver Umgang mit Fehlern in Gesundheitsorganisationen* [Schriftenreihe Nr., 3, Empfehlungen für Kader, Kollegen und Betroffene]. Zürich: Patientensicherheit Schweiz, 2010.
71. Kellogg KM, Hettinger Z, Shah M, et al. Our current approach to root cause analysis: is it contributing to our failure to improve patient safety? *BMJ Qual Saf*. 2017;26(5):381–7.
72. Schiess C, Schwappach D, Schwendimann R, Kobleder A, Senn B. The second victims of human fallibility. *Krankenpfl.* 2016;109:8–11.
73. Daniels RG, McCorkle R. Design of an evidence-based “second victim” curriculum for nurse anesthetists. *AANA J* 2016;84:107–13.
74. Burlison JD, Scott SD, Browne EK, et al. The Second Victim Experience and Support Tool: validation of an organizational resource for assessing second victim effects and the quality of support resourcess. *J Patient Saf* 2017;13:93–102.
75. Mohrer D, Liberati A, Tetzlaff J, et al. Preffered reporting items for systematic reviews and meta-analysis: the PRISMA statement. *J Clin Epidemiol* 2009;62:1006–12.
76. International Organization for Standardization, International Standard ISO 5807: Information Processing – Documentation Symbols and Conventions for Data, Program and System Flowcharts, Program Networks, Charts and Syste Ressources Charts. 1985. Available at: https://www.iso.org/obp/ui/#iso:std:iso:5807:ed-1:v1:en/. Accessed November 16, 2017.

FIGURES & TABLES

Figures

Tables

Table 1: Search string in PubMed, CINAHL and PsycINFO

Concepts	Key words combined with Boolean operators
Setting	"acute care" OR "acute care setting" OR "acute care settings" OR "acute setting" OR "acute settings" OR "clinic" OR "clinics" OR "hospital" OR "hospitals"
	AND
Population	"healthcare professional" OR "healthcare professionals" OR "healthcare provider" OR "healthcare providers" OR "resident" OR "residents" OR "second victim" OR "second victims"
	AND
Causes	"adverse event" OR "adverse events" OR "adverse patient event" OR "adverse patient events" OR "error" OR "errors" OR "mistake" OR "mistakes" OR "patient harm" OR "patient harms" OR "patient safety event" OR "patient safety events" OR "patient safety incident" OR "patient safety incidents" OR "unanticipated outcome" OR "unanticipated outcomes"
	AND
Evaluation	"affected" OR "anger" OR "anxiety" OR "burnout" OR "coping" OR "depression" OR "distress" OR "emotional" OR "experience" OR "fatigue" OR "fear" OR "feelings" OR "frustration" OR "guilt" OR "impact" OR "meaning" OR "psychological" OR "safety culture" OR "sleep" OR "stress" OR "support" OR "traumatic"
	AND
Design	"content analysis" OR "ethnographic study" OR "ethnography" OR "grounded theory" OR "interview" OR "interviews" OR "interviewed" OR "phenomenological study" OR "phenomenology" OR "qualitative study" OR "thematic analysis"

(author's own chart)

Table 2: Characteristics of included studies

Author /year	Design/Setting/ Country	Sample	Event	Aim/Research question	Data collection	Data analysis	Results
Balogun *et al.*, 2015[32]	*Design:* Explorative-descriptive qualitative design *Setting:* University hospitals (n=6) *Country:* Canada	*Targeted sample:* 23 physicians, 27–37 years with various ethnic and religious background (assistant physicians n=14; physicians in specialist training: n=9; neurosurgery: n=12; general surgery: n=8; women: n=7; men: n=16)	*Catastrophic error events;* defined as error events having entailed serious harm or having resulted in deaths	The aim was to understand the response and coping strategies of surgical assistants and to recommend possibilities of support**.**	Semi-structured individual interviews (n=23)	Open and axial coding (Strauss *et al.*, 1990)	Indications that catastrophic error events represent system deficits rather than individual errors. In spite of experiencing a wide array of emotions, surgical assistance physicians learn from error events. Irrespective of highly valued mentoring relationships with senior staff, they do not feel safe enough to actively approach superiors. Consulting services should be at their disposal, probably offering a benefit. Surgical culture proved to be a barrier to help-seeking behaviour as emotional vulnerability is often equated with personal weakness.
Christensen *et al.*, 1992[33]	*Design:* Explorative-descriptive qualitative design *Setting:* Public hospital *Country:* USA	*Targeted sample:* 11 physicians with practical experience between 4 and 18 years (min. 4 years) (medical sub-specialities: n=7; general medicine: n=3; women: n=3; men: n=8)	*Error events;* individually defined by physicians	The aim was to describe how physicians think and feel about error events and to investigate which beliefs influence their emotional response.	Semi-structured individual interviews (n=11)	Analysis according to guideline criteria	Indications that physicians experience error events in a unique way and are affected by a wide sphere of long-lasting emotions. After an initial shock, they experience e.g. fear, guilt, anger, embarrassment, humiliation and depressive symptoms. Emotion-focused and problem-centred coping (e.g. dealing emotionally with the event or learning from the event) are significantly influenced by insufficient control, characteristic for medicine. Disclosing an event towards patients rarely occurs.
Crigger *et al.*, 2007[34]	*Design:* Grounded Theory *Setting:* Public hospital *Country:* USA	*Theoretical sample:* 10 nurses between 25 and 57 years with practical experience between one year and 35 years and various ethnic, religious and educational background (Bachelor of Nursing: n=8; Associate Degree: n=2; women: n=9; men: n=1)	*Error events;* defined as measures having actually or potentially entailed harm	The aim was to investigate the psychosocial process starting with the realization of an error event and to examine how participants manage to reconcile their self-esteem and professional image (self-reconciliation).	Semi-structured individual interviews (n=10)	Open, selective and axial coding of transcripts	Indications that following error events, nurses pass a process of four consecutive and/or discursive steps leading to self-reconciliation with regard to self-esteem, personality and professional image. The four steps comprise *realisation of having committed an error* (reality hitting), *evaluating the need to disclose the event* (weighing in), deciding the best way of responding (acting) and evaluating the event and subsequently "moving on“ (repair).
Engel *et al.*, 2006[35]	*Design:* Explorative-descriptive qualitative design *Setting:* University hospital *Country:* USA	*Stratified random sample:* 26 assistant physicians between 25 and 39 years with various educational backgrounds (medicine: n=17; surgery n=5; gynaecology and obstetrics: n=4; women: n=12; men: n=14)	*Error;* defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve this aim". *"Near miss"* is defined as “an event or situation that could have resulted in an accident, injury, or illness, but did not, either by chance or through timely intervention“	The aim was to investigate the emotional challenges associated with medical error events and the ways of coping with this difficult events	Semi-structured individual interviews (n=26)	Iterative analysis	Indication that following adverse events, assistant physicians have to deal with distress and intensive emotional responses, e.g. guilt, self-doubt, frustration, anger, confusion, fear, isolation, depending on the degree of negative effects associated with the event. While coping requires relief and learning possibilities, conversations about error events with other healthcare professionals and superiors proved to be of central significance.

Author /year	Design/Setting/ Country	Sample	Event	Aim/Research question	Data collection	Data analysis	Results
Kroll *et al.*, 2008[36]	*Design:* Explorative-descriptive qualitative design *Setting:* Hospitals (n=10) *Country:* England	*Stratified random sample:* 38 assistant physicians with experience in their role between 6 and 12 months	*Error events;* not defined (e.g. diagnosis or treatment error)	The aim was to investigate the experiences, perceptions and meaning of error events and to examine reasons for and against disclosure	Semi-structured individual interviews (n=38)	Open, axial and selective coding according to a modified Grounded Theory approach (no reference indicated)	Indications that assistant physicians to some extent informally discuss error events in supportive teams with peers. Disclosing an error event towards patients is, however, rare. In dealing with error events, many assistant physicians received support and attributed a central, favourite role to colleagues with regard to prevention and minimisation of harm. While formal conversations and constructive-supportive feedbacks can probably enhance learning, accusations and reassurance proved obstructive if they were preferred to learning.
Luu *et al.*, 2012[37]	*Design:* Grounded Theory *Setting:* University hospitals (n=3) *Country:* Canada	*Theoretical sample:* Stage I: 20 experienced (n=12) and inexperienced (n=8) surgeons (general surgery: n=13; neurosurgery: n=3; cardiosurgery/urology, gynaecology/obstetrics /vascular surgery: 1 n=1; women: n=5; men: n=15) Stage II: Six general surgeons, allowing to be interviewed within 24 hours after an adverse event	*Adverse events;* defined as events entailing harm caused by medical treatment and not by the course of the disease.	The aim was to investigate responses and psychological consequences of adverse events and to assess them with regard to judgement and decision-making.	Semi-structured individual interviews (stage I: n=20) (stage II: n=6)	Inductive qualitative data analysis with subsequent deductive-qualitative analysis of the reference model (Scott *et al.*, 2009)	Indications that surgeons have the impression to be "the only one“ experiencing fear, stress and self-doubts, with possible gender differences. The authors elaborated a four-stage response conforming to the model of Scott et al. (2009), ranging from feelings of failure accompanied by physiological stress response, loss of control and concurrent need for recovery and restoration, involving long-term effects (meaningfulness vs. change of occupation, consequences concerning judgement and decision-making).
Mankaka *et al.*, 2014[38]	*Design:* Phenomenology *Setting:* University hospital with patients after adverse events in regional hospitals (n=6) and university hospitals (n=2) *Country:* Switzerland	*Targeted sample:* 8 assistant physicians (general internal medicine) between 28 and 33 years between second and sixth year of assistance, being responsible for typical adverse events.	*Error events;* not defined (e.g., missed diagnosis, inadequate monitoring)	The aim was to answer the question: How do assistant physicians experience medical error events and which kinds if coping strategies do they utilize?	Semi-structured individual interviews (n=8)	Inductive-thematic analysis with deductive approaches	Indications that following error events caused by e.g. tiredness or overwork, assistant physicians can be affected by strong emotional distress in the context of insufficient safety cultures. However they can also receive various forms of support from superiors. The most important coping strategy proved to be talking about error events. Defensive and constructive changes are possible as a result of error events. Male physicians seem to be less sensitive and more self-confident than female physicians.

Author /year	Design/Setting/ Country	Sample	Event	Aim/Research question	Data collection	Data analysis	Results
May *et al.*, 2012[39]	*Design:* Explorative-descriptive qualitative design *Setting:* Academic institutions and medical practices *Country:* USA	*Casual sample:* 61 physicians (women: n=28; men: n=33), average: 46 years, from various subspecialties, being ready to talk about an adverse event (most frequently misdiagnosis) disclosed to patients and families in 61% of cases. Included are data of 46 physicians reaching “wisdom” after being involved in an error event.	*Serious error events;* defined as events having resulted in disability, extended length of stay or deaths	The aim was to investigate the significance of talking to patients, colleagues and families following serious error events.	Semi-structured in-depth individual interviews (n=61)	Coding according to the interview-guideline with subsequent modified taxonomic analysis (Spadley, 1979)	Indications that not talking about serious error events has an isolating effect on physicians, prevents from reflecting the event, thereby impeding the possibility of learning. While serious conversations are of central importance with regard to recovery and attribution of meaning, dishonest, inhuman, accusatory, insensitive or egotistical ways of talking about the event proved obstructive. This is also the case for "well-intended“ minimalisation of the error on the part of colleagues and family members. Fearing legal consequences of conversations represents a major barrier to talking openly about the error event.
Mohsenpour *et al.*, 2016[40]	*Design:* Phenomenology *Setting:* Public and private hospitals (n=4) *Country:* Iran	*Targeted sample:* 8 nurses (Bachelor degree: n=6; Master degree: n=2; women: n=6, men: n=2) between 30 and 50 years old with professional experience between one year and 24 years	*Error events;* not defined	The aim was to answer the question: What does it mean to be perceived as a culprit due to involvement in an error event?	Semi-structured individual interviews (n=8)	Thematic analysis (van Manen, 2001)	Indications that following error events, nurses are confronted with unpleasant physical symptoms (e.g., heat sensitivity), negative emotions (e.g., fear), and remorse. Additionally, they are affected by detailed traumatic memories. Changes resulting from error events can affect the assumption of responsibility, learning from error events, strengthening supportive relationships and spirituality.
Pinto *et al.*, 2013[41]	*Design:* Phenomenology *Setting:* University hospitals (n=2) *Country:* England	*Targeted sample:* 27 specialist physician (general/vascular surgery; women n=5; men: n=22) with professional experience in the current position of minimal three years	*Surgical complications;* defined as deviation of post-surgical standard	The aim was to investigate personal and professional consequences of surgical complications and to examine factors influencing the response as well as coping with consequences and use of support.	Semi-structured individual interviews (n=27)	Interpretative phenomeno-logical *analysis* (Smith *et al.*, 2003)	Indications that owing to complications, surgeons in the long term are affected by personal and professional consequences (emotional, behavioural, cognitive, social and otherwise), according to the possibility of avoiding these complications. Influencing factors consist of the particularities of the individual case, the surgeon´s own personality, as well as characteristics of patients and families (e.g. outcomes and reactions), teams and organisations (e.g. blame-culture). Discussions about complications, reconstruction of the event and rationalization, aiming at problem- and emotion-focused coping proved to be the most important and most frequently available resource, in addition to collegial support. In contrast, organisational support was described as insufficient.

Author /year	Design/Setting/ Country	Sample	Event	Aim/Research question	Data collection	Data analysis	Results
Plews-Ogan *et al.*, 2013[42]	*Design:* Grounded Theory *Setting:* Academic institutions and medical practices *Country:* USA	*Casual sample:* 61 physicians (women: n=28; men: n=33) with a median age of 46, various specialisations, willing to talk about a serious error event (mostly diagnostic error). Disclosure to patients occurred in 61% of cases. Data are considered of 46 physicians who reached “wisdom" after error involvement.	*Serious error events;* defined as events having actually or potentially entailed harm (including disability, death or additional medical care)	The aim was to investigate the experience of positive coping associated with serious error events	Semi-structured individual interviews (n=61)	Data analysis according to Grounded Theory (coding and constant comparative analysis)	Indications that as a result of serious adverse events, physicians can attain growth and "wisdom“ via a circular process. After accepting the reality, learning from the event becomes possible as the basis for integrating experiences and reaching advanced ways of perceiving, thinking and acting. In this context, "wisdom“ can be interpreted as a result of reflected experience. A central aspect of this experience is the development of a balance between humility regarding imperfection and self-confidence as a result of positive changes
Rassin *et al.*, 2005[43]	*Design:* Explorative-descriptive qualitative design *Setting:* Major national hospital *Country:* Israel	*Casual sample:* 21 nurses (Bachelor degree: 60%; women: n=14; men: n=7), between 21 and 52 years of professional experience, having been involved in a medication error. The event occurred between three and 24 months before the interview	*Medication error;* defined as, e.g., dosage errors or administration error	The aim was to investigate the consequences of medication errors on the psychological and social condition. The focus was on subjective perception of the error event and coping with consequences.	Semi-structured in-depth individual interviews (n=21)	Content analysis (Berg, 1998)	Indications that stress, pressure and negligence represent central error-promoting factors in the process of medication. Nurses respond to some extent in a long-term physical and emotional way (e.g., with fear and guilt). Initially they try to cope with consequences and with their responsibility in a rather problem-focused way. Afterwards they pass over to a rather emotion-focused manner of coping, e.g., by talking with their family about error events and by learning from this event.
Rinaldi *et al.* 2016[44]	*Design:* Explorative-descriptive qualitative design *Setting:* Local health care service and university hospital *Country:* Italy	*Targeted sample:* 33 healthcare professionals (nurses: n=20; physicians: n=6; midwifes: n=4; others: n=3; women: n=20; men: n=13) with professional experience between 3 and 20 years, being able to describe minimally one (most serious) event, having occurred between five and 132 months before the interview	*Adverse events;* not defined	The aim was to investigate psychosocial consequences of adverse events, focusing on recovery and current support.	Semi-structured individual interviews (n=33)	Analysis by means of Qualitative Data Analysis Guides of Leuven (Dierkx de Casterleé *et al.*, 2012)	Indications that following adverse events, healthcare professionals can be affected by headache and stomach pain, additionally to the physical and psychosocial symptoms often described in the literature, e.g., extreme tiredness, increased respiratory rate, intrusions, fear of returning to the work place). In this study, participants passed through the six stages towards restoring integrity described by Scott et al. (2009) in an American comparative population. Participants expressed their wish for external psychological support and experienced support they received as insufficient. Therefore, less than half of the participants made use of psychological support. The need to talk about the event and to receive understanding was particularly pronounced.
Santos *et al.*, 2007[45]	*Design:* Explorative-descriptive qualitative design *Setting:* Hospital *Country:* Brasil	*Targeted sample:* 15 nurses (predominantly female nursing assistants) between 22 and 49 years, having been involved in an medication error	*Medication error;* not defined	The aim was to identify feelings and coping strategies	Semi-structured individual interviews (n=15)	Thematic analysis (Polit *et al.*, 2004)	Indications that after medication errors, nurses can be affected by panic, despair, concern, guilt, shame and uncertainty. To reach a feeling of calmness, they search for help in conversations and learn from error events, thereby developing strategies to avoid error events in the future.

Author /year	Design/Setting/ Country	Sample	Event	Aim/Research question	Data collection	Data analysis	Results
Schelbred *et al.*, 2007[46]	*Design:* Explorative-descriptive qualitative design *Setting:* Hospitals, community services, nursing homes (n=7 bzw. n=2 bzw. n=1) *Country:* Norway	*Targeted sample:* 10 nurses with professional experience between 6 months and almost 30 years, involved in medication errors having actually or potentially resulted in significant patient harm	*Medication error;* defined as events having actually or potentially entailed significant injuries (e.g., dosage error or application error)	The aim was to describe the experiences of nurses involved in serious medication errors in order to investigate which kind of support they received after disclosing the error event.	Semi-structured in-depth individual interviews (n=10)	Phenomenological interpretation and analysis (Giorgi, 1985 and 1997)	Indications that following medication errors, nurses are personally and professionally deeply affected, depending, in part, on others´ responses. Immediately after a medication error, they respond with panic. However, despite paralysis, exhaustion and loss of control, they try everything to alleviate the harm experienced by the affected patient. Particularly after events entailing irreversible harm, nurses report about personal and professional traumatization, accompanied by guilt, shame, betrayal, suicidal thoughts or the intention to leave the profession. Most nurses articulate the need for support and attest a better healing effect to conversations with colleagues than with friends or family members. However, they mostly do not receive sufficient support. Overall, nurses are willing to share their experience. This, however, implies the possibility to feel trust.
Schwappach *et al.*, 2010[47]	*Design:* Explorative-descriptive qualitative design *Setting:* Hospitals *Country:* Switzerland	*Targeted sample:* 11 nurses, 7 physicians	*Error event;* not defined	The aim was to investigate the needs for supportive interventions and to identify factors allowing and fostering positive coping and overcoming error-related stress.	Focus group interviews (n=3)	Qualitative analysis	Indications that nurses and physicians in Swiss hospitals are affected by emotional responses similar to those described in international literature (e.g., vegetative reactions, guilt, shame). To receive support, they search for a person of trust and articulate the need for a committee offering support on the emotional level, supplementary to the CIRS committee. They also express the necessity of education and further education as well as for support programs with the aim of learning to cope with error events. According to the results, nurses show different ways of dealing with error events.
Scott *et al.*, 2009[2]	*Design:* Explorative-descriptive qualitative design *Setting:* University hospital *Country:* USA	*Targeted sample:* 31 health care professionals with professional experience between six months and 36 years (physicians: n=10; nurses: n=11; others: n=10; women: n=18; men: n=13); the event took place between three months and 44 months before the interview	*Adverse event;* not defined	The aim was to describe and characterize the experiences and the course of restoration	Semi-structured individual interviews (n=31)	Iterative reading, classification of stages and characterisation	Indication that confrontation with an adverse patient event can be a life-altering experience for healthcare professionals, independent of gender, profession and professional experience, releasing psychosocial (frustration) and physical symptoms (extreme tiredness) as well as trigger-related flashbacks. Emotions can be classified by means of a six-step course leading towards restoration, comprising chaos, response, intrusions, restoration of personal integrity, enduring the investigation, receiving emotional first aid and “moving on“ in three ways: leaving the profession, surviving or thriving in professional life.
Ullström *et al.*, 2014[48]	*Design:* Explorative-descriptive qualitative design *Setting:* University hospital *Country:* Sweden	*Targeted sample:* 21 health care professionals with professional experience between five and 30 years (physicians: n=10; nurses: n=9; others: n=2; women: n=16; men: n=5)	*Serious adverse events;* defined as events having actually caused harm or having a high risk to cause harm (e.g., medication error or diagnostic error)	The aim was to investigate how healthcare professionals are affected by avoidable serious adverse events; the focus was on desired and received organisational support.	Semi-structured individual interviews (n=21)	Qualitative content analysis (Shanon *et al.*, 2005; Graneheim *et al.*, 2004)	Indications that adverse events can have a personal effect (emotional distress) as well as a professional long-term effect on health care professionals, depending on the response of the organisation. Many professionals react emotionally, e.g., with shock, sadness or fear and feel uncertain about their professional role. Although they express the need to talk about the event and to receive emotional support from the organisation and from peers, organisational support is insufficient, unstructured and unsystematic. Lack of support and feedback complicates emotional processing.

Author /year	Design/Setting/ Country	Sample	Event	Aim/Research question	Data collection	Data analysis	Results
van Gerven *et al.*, 2016[49]	*Design:* Explorative-descriptive qualitative design *Setting:* Hospitals *Country:* Belgium	*Casual sample:* 31 health care professionals (nurses: n=17; physicians; n=11; midwives: n=3), having been directly involved in patient safety events resulting in deaths (n=14), serious harm (n=9), short-term harm (n=7) or no harm (n=1). Excluded were health care professionals having been involved in legal cases or having been involved only indirectly in patient safety events	*Patient safety events;* defined as events or circumstances causing or having caused harm	The aim was to identify the consequences of patient safety events with regard to coping strategies, support needs and received support and to identify factors influencing the extent of "second victim" experience.	Semi-structured in-depth individual interviews (n=31)	Using sensitive concepts (Bower, 2006)	Indications that following serious patient safety events, healthcare professionals are personally and professionally affected by symptoms presenting on an emotional, psychological and physical level. They use several problem- and emotion-focused coping strategies. One of the aims consists of learning from the event. Therefore, “second victims“ should be, for example, integrated into root-cause analyses. However, repression and flight are also common ways of coping. To openly discuss patient safety events, safety culture is required as a supportive basis, formed by colleagues, families and professionals. The extent of the consequences on „second victims“ depends on various personal, situational and organisational aspects

(author’s own chart)

Table 3: Metasummary

	Transactional „second victim“ experience						
Category / **Author/year**	**Safety culture***	**Health care professional**	**Appraising the situation**	**Restoring integrity***	**Continuing professional life**	**Intensity (%)** dichotomous	continually / n=2015
Balogun et al., 2015[32]	33	10	10	21	1	100	4
Christensen et al., 1992[33]	34	24	48	32	7	100	7
Crigger et al., 2007[34]	11	10	33	67	1	100	6
Engel et al., 2006[35]	39	4	29	17		80	4
Kroll et al., 2008[36]	32	14	11	15	1	100	4
Luu et al., 2012[37]	22	9	24	19	5	100	4
Mankaka et al., 2014[38]	17	12	15	13		80	3
May et al., 2012[39]	87		8	10		60	5
Mohsenpour et al., 2016[40]	23	10	90	18		80	7
Pinto et al., 2013[41]	45	25	29	26	1	100	6
Plews-Ogan et al., 2013[42]	11	5	3	57	16	100	5
Rassin et al., 2005[43]	8	5	16	16		80	2
Rinaldi et al., 2016[44]	30		64	15	9	80	6
Santos et al., 2007[45]	4	1	18	8	1	100	2
Schelbred et al., 2007[46]	47		44	39	7	80	7
Schwappach et al., 2010[47]	76	3	11	9		80	5
Scott et al., 2009[2]	25	4	50	20	14	100	6
Ullström et al., 2014[48]	34	7	39	21	2	100	5
van Gerven et al., 2016[49]	114	17	73	57	3	100	13
Frequency (%)							
dichotomous	100	84	100	100	68		
continually	34	8	31	4	3		

*intersecting categories

(author’s own chart)

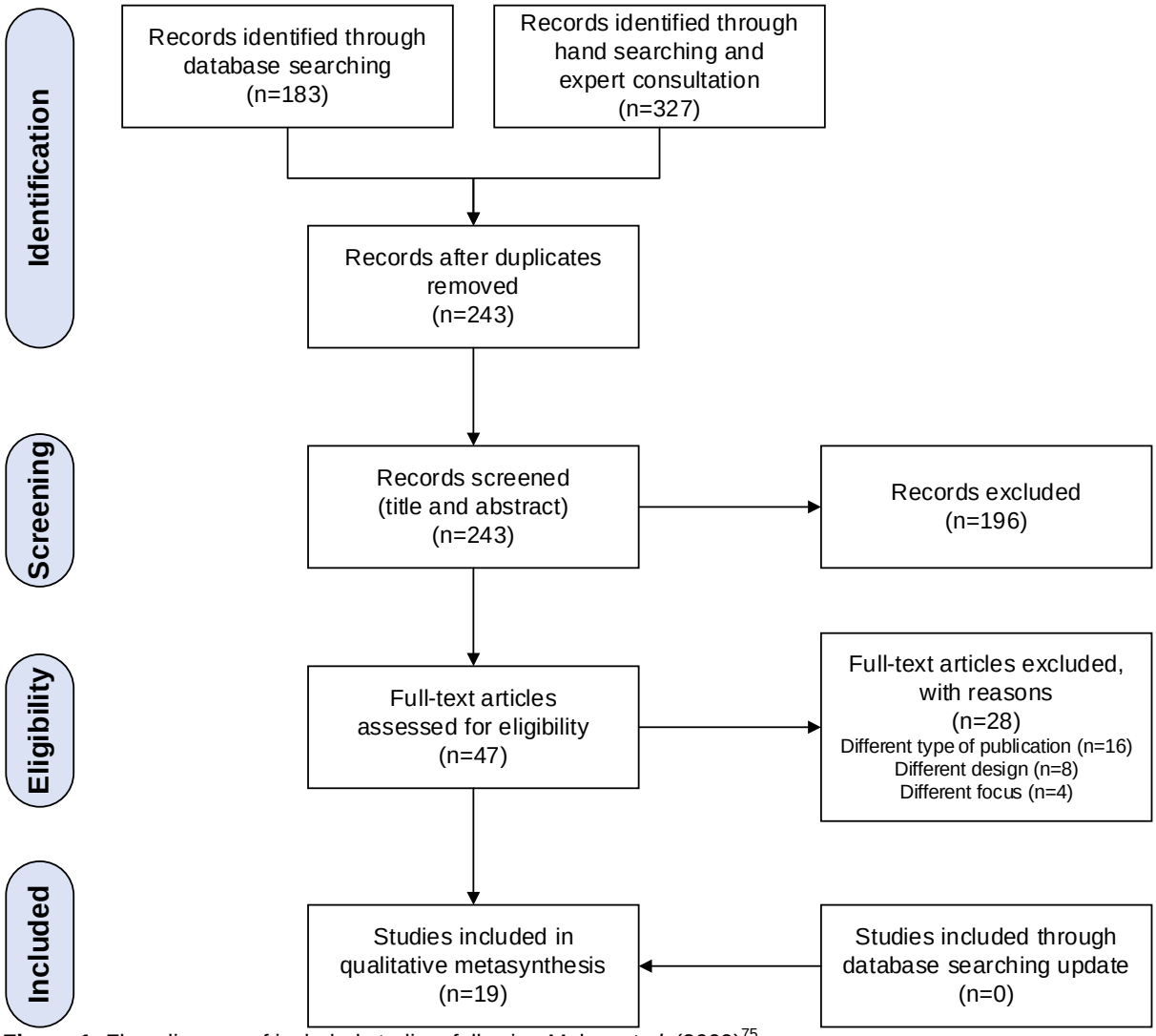
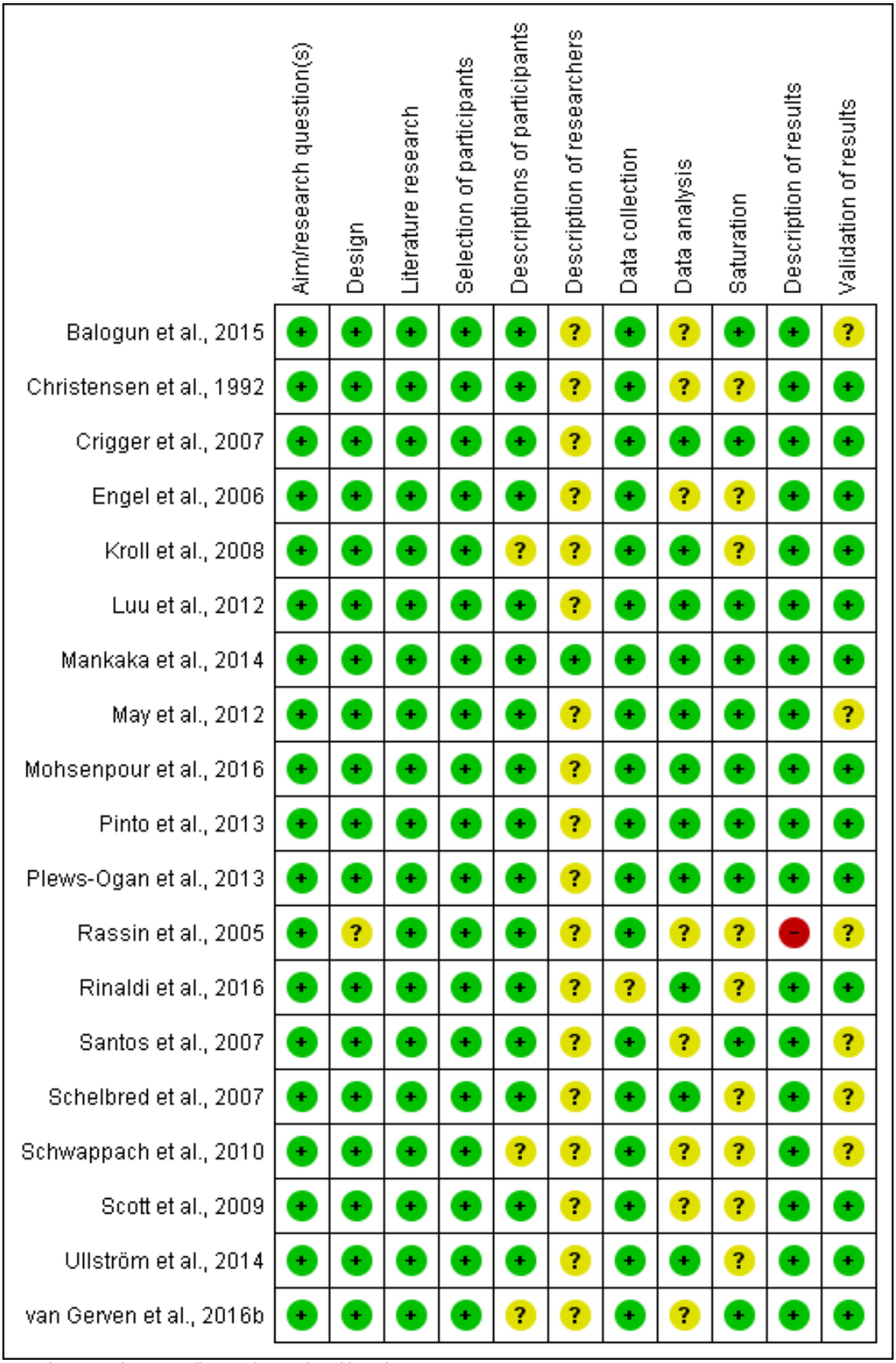


Figure 1: Flow diagram of included studies, following Moher *et al.* (2009)[75]



Legend: green=adequate, yellow=unclear, red=problematic

Supplement 2: Methodological quality of included studies
(author's own chart, elaborated by means of review manager 5.3, Nordic Cochrane Centre, 2014).

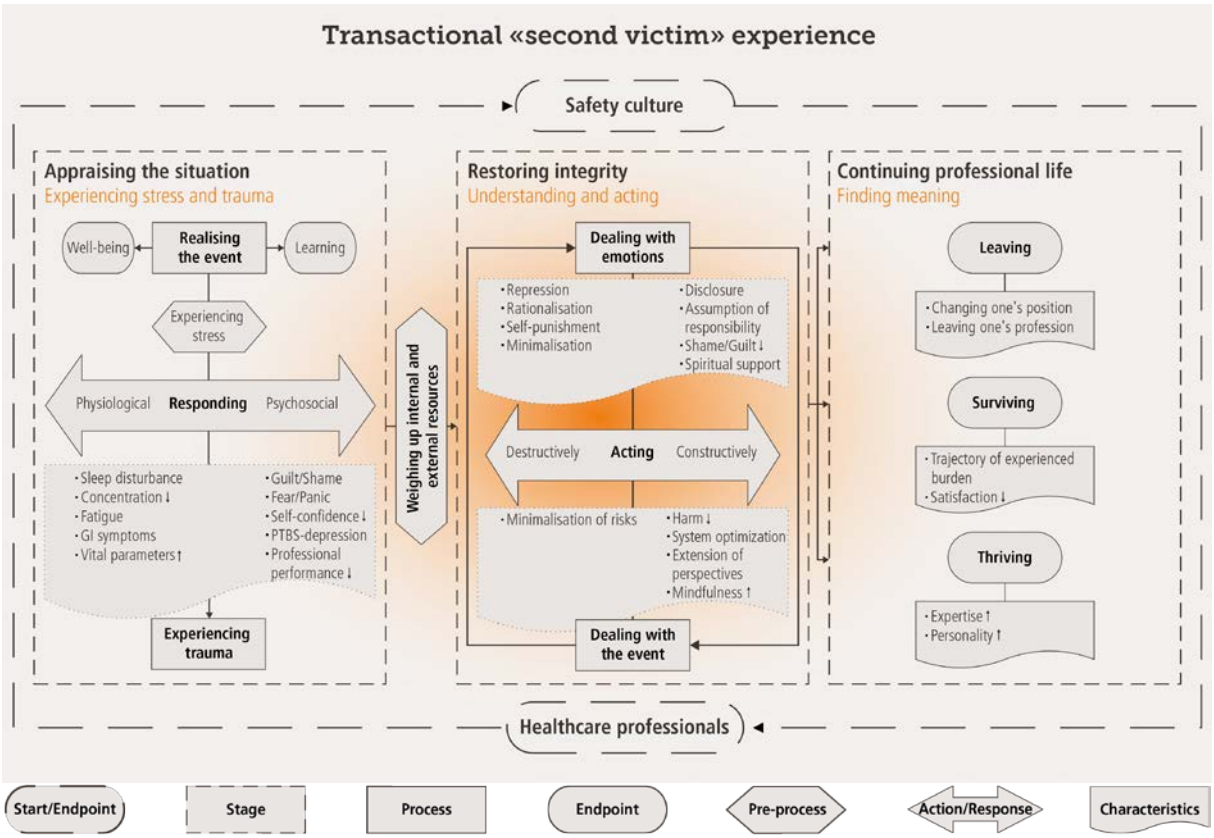


Figure 2: Transactional "second victim" experience (author's own chart)